REMARKS

Examiner Akilulu K. Woldemariam is thanked for the thorough examination and search of the subject Patent Application.

Paragraphs [0001] and [0020] has been modified in order to fill missing information about a copending patent application:

> "[0001] This application is related to U.S. patent application Ser. No. ~~_____~~ 10/830,329 docket number DS03-025, ~~U.S. Ser. No. _____~~ filed ~~_____~~ April 27, 2004 and assigned to the same assignee as the present invention."

> "Said method is based on the methods to convert the resolution of digital images disclosed with U.S. patent application Ser. No. 10/830,329 docket number DS03-025, filed April 27, 2004 and assigned to the same assignee as the present invention."

All Claims are believed to be in condition for Allowance, and that is so requested.

Reconsideration of the rejection of claims 1, 2,10-11, 14-15,24, and 25 under 35 U.S.C. 103(a) as being unpatentable over Echerer et al., hereinafter Echerer, (US Patent 5,740,267) in view of Okuno et al., thereinafter Okuno (US Patent 6,546,157) is requested, based on the following remarks:

Claim1 of the claimed invention discloses:

1. A method to zoom a region of interest from a digital image comprises the following steps:

(1) define size and location of region of interest as part of source image;

(2) calculate scale of conversion in x- and y-direction;

(3) calculate number of rows of pixels of destination image according to scale of conversion desired in y-direction;

(4) calculate number of pixels contained in a row of pixels of destination image according to scale of conversion desired in x-direction;

(5) calculate color values of each pixel along the rows of pixels of the destination image by interpolation from nearest row of pixels of source image; and

(6) display zoomed region of interest in destination image.

Echerer discloses (col.1; lines, 14-23):

"FIELD OF INVENTION AND RELATED APPLICATIONS

The present invention relates to an apparatus for acquiring a **radiographic image**, enhancing the image and extracting useful data from the image, and storing the enhancements and data such that relationships of objects represented in the image, or in other images, can be determined. **In particular, the present invention relates to analysis and diagnosis of x-rays for such applications as chiropractic."**

Furthermore Echerer discloses (col. 7; lines 21-29):

"The invention, in its preferred embodiment, **scans an existing x-ray film** to acquire an image. As indicated above and illustrated in FIG. 7, other image sources can be used to obtain images, including dental x-rays, MRI, CT, nuclear medicine, mammogram, ultrasound, scanned photograph, digitized video, radar, digital x-my, electronic endoscope, and angiographic systems--**in short, any other type of image source wherein the image is recorded digitally for the purpose of diagnostics or decision making.**

Applicant respectfully disagrees that Echerer discloses step (1) of the method of claim 1 of the claimed invention: "(1) define size and location of region of interest as part of source image;".

Examiner has cited Echener (col. 1, lines 66-67, col. 5, line 12, and col. 8, lines 30-31) in regard of the definition of size and location of region of interest.

Echener discloses (col.1, lines 65-col. 2 line 1):

> "The apparatus obtains a plurality of dynamic tomographic images by repeatedly photographing a region of interest and storing the images in a memory for subsequent display."

Furthermore Echener discloses (col. 5, line 12):

> "An "image" can be acquired from many sources."

Moreover Echener discloses (col.8, lines 11-31):

> "After the patient has been identified and the image has been completely identified, the CPU passes the image parameters to the scanner or video camera, and the user is instructed to place the x-ray film on the scanner bed or on the camera lightbox and then to press the SCAN button. The scanner or video camera then retrieves the scanned image and, as stated above, stores it in RAM memory for instant display on the monitor.
>
> Alternatively, using other types of image generation systems, this digital image acquisition function is performed by means of importing the image from an MRI unit or other electronic imaging systems.
>
> Once obtained and displayed, the image is given a unique filename which, just as with the patient number, is partially and serially generated from the Counters Database, as well as partially named with a system identifier, so that the image filename is unique regardless of how or when the image may be passed to other systems later.
>
> **Basic image attributes (resolution, original film size, number of pixels in the x and y directions),** ScanType, image filename and patient number are then saved to the Image Database."

The sentence above in bold characters has been cited by the examiner.

Applicant believes that the paragraphs cited above refer to an unenhanced source

image and subsequently the basic attributes of the last paragraph above refer to an **unenhanced source image** and **not to an area of interest** as claimed in claim 1. Therefore applicant believes that Echerer does not disclose "(1) define size and location of region of interest as part of source image;" as claimed in claim 1 of the claimed invention.

As stated by the examiner, Echener does not disclose steps 2-5 of the method of claim 1 of the claimed invention:

> "(2) calculate scale of conversion in x- and y-direction;
> (3) calculate number of rows of pixels of destination image according to scale of conversion desired in y-direction;
> (4) calculate number of pixels contained in a row of pixels of destination image according to scale of conversion desired in x-direction;
> (5) calculate color values of each pixel along the rows of pixels of the destination image by interpolation from nearest row of pixels of source image;"

Okuno discloses in his abstract:

> "A number-of-pixels conversion apparatus for converting the number of pixels of an original image or a display apparatus using the same has an interpolation coefficient generator for generating an interpolation coefficient that is obtained by a function with the distance between an interpolation pixel and a reference pixel, said function has a first derivative that is smaller than -1 at least in a partial range, whereby the apparatus enables a pixel data interpolation process that produces a post-conversion image that is low in the degree of blurring even if the original image has a steep density variation.

It should be noted that Okuno does not disclose "(5) **calculate color values** of each pixel along the rows of pixels of the destination image by interpolation from nearest row of pixels of source image" as the claimed invention discloses in claim

1.does. Furthermore it should be noted that the words "**color**" or "**colour**" do **not even appear** in the disclosure of Okuno. Moreover Okuno does not disclose any zooming. The word zoom does not appear in his description.

None of the applied or known references disclose (1) define size and location of region of interest as part of source image; or "(5) calculate **color values** of each pixel along the rows of pixels of the destination image by interpolation from nearest row of pixels of source image" as the claimed invention does in claim 1. A combination of applied or known prior art references would not yield the claimed invention and is believed to be non-obvious.

The same arguments apply for claim 14 of the claimed invention as outlined above for claim 1. Claim 14 discloses:

> **14.** A method to zoom a region of interest from a digital image comprises the following steps:
> (1) define size and location of region of interest as part of source image;
> (2) calculate scale of conversion in x-and y-direction;
> (3) calculate number of columns of pixels of destination image according to scale of conversion desired in x-direction;
> (4) calculate number of pixels contained in a column of pixels of destination image according to scale of conversion desired in y-direction;
> (5) calculate **color values** of columns of pixels of destination image by interpolation from nearest column of pixels of source image; and
> (6) display zoomed region of interest in destination image.

None of the applied or known references disclose (1) define size and location of region of interest as part of source image;" or "(5) calculate color values of columns of

pixels of destination image by interpolation from nearest column of pixels of source image" as the claimed invention does in claim 14. A combination of both prior art references cited would not yield the claimed invention and is believed to be non-obvious.

The **combination** of a "Radiographic image enhancement comparison and storage requirement reduction system" (Echerer) with "number-of-pixel conversion apparatus and display apparatus using the same" (Okuno) is believed to be **non-obvious** to achieve a method to zoom a region of interest from a digital image comprising the step of "(1) define size and location of region of interest as part of source image; and (5) calculate **color values** of each pixel along the rows of pixels of the destination image by interpolation from nearest row of pixels of source image" as taught by the claimed invention. The invention is believed to be patentable over the prior art cited, as it is respectfully suggested that the combination of these various references cannot be made without reference to Applicant's own invention. **None** of the applied references **address or suggest** (1) define size and location of region of interest as part of source image; or "(5) calculate color values of each pixel along the rows of pixels of the destination image by interpolation from nearest row of pixels of source image" which has been disclosed by the claimed invention. Applicant has claimed his process in detail.

The methods of Claims 1 and 14 are believed to be novel and patentable over these various references, because there is not sufficient basis for concluding that the

combination of claimed elements would have been obvious to one skilled in the art. That is to say, there **must be something in the prior art or line of reasoning to suggest** that the combination of these various references is **desirable**. We believe that there is **no such basis for the combination**. We therefore request Akilulu K. Woldemariam to reconsider his rejection in view of these arguments.

Claims 2, 10, 11, 15, 24 and 25 are dependent claims upon base claim 1 or respectively of base claim 14, which are believed to be patentable according to the arguments above.

Reconsideration of the rejection of claims 3, 4, 8, 9, 13, 16, 17, 21-22, 26-30, 34-35, and 37-40 under 35 U.S.C. 103(a) as being unpatentable over Echerer in view of Okuno as applied to claims 1 and 14 above and further in view of Harasimiuk (US Publication number 2002/0154123A1), is requested, based on the following remarks:

Claims 3, 4, 8, 9, 13, 16, 17, 21, 22, and 26 are dependent claims upon base claim 1 and respectively of base claim 14, which are believed to be patentable according to the arguments above.

Claim 27 of the claimed invention discloses:

> **27.** A method to zoom a region of interest from a digital image comprises the following steps:
> (1) define size and location of region of interest as part of source image;

(2) calculate the scale of conversion of the resolution in x- and y-direction;

(3) calculate number of rows of pixels of destination image according to scale of conversion desired in y-direction;

(4) calculate number of pixels contained in a row of pixels of destination image according to scale of conversion desired in x-direction;

(5) calculate x, y virtual starting point of destination pixel for each frame;

(6) calculate virtual location of first destination pixel for new row in x-direction and interpolate new color values of color space of said first destination pixel from nearest source pixels located at nearest row of source pixels in y-direction;

(7) calculate virtual position of next destination pixel in x-direction according to scale factor and interpolate new color values of color space used of said next pixel from nearest source pixels located at nearest row of source pixels in y-direction;

(8) go to next step (8) if last destination pixel in x-direction has been reached otherwise go to step (6);

(9) go to step (11) if last row of destination pixels has been reached otherwise go to next step (9);

(10) calculate virtual location of next row in y-direction according to scale factor in y-direction and go to step (5); and

(11) display zoomed region of interest in destination image.

As outlined above neither Echerer nor Okuno disclose "(1) define size and location of region of interest as part of source image; or "(6) calculate virtual location of first destination pixel for new row in x-direction and interpolate new color values of color space of said first destination pixel from nearest source pixels located at nearest row of source pixels in y-direction;" or "(7) calculate virtual position of next destination pixel in x-direction according to scale factor and interpolate new color values of color space used of said next pixel from nearest source pixels located at nearest row of source pixels in y-direction". Okuno does **not disclose any color processing**.

Harasimiuk discloses in his abstract:

"A method and a system for scaling a digital source image consisting of a grid of X by Y pixels into a target image of a different resolution comprises the steps of/tools for: mapping the source pixels onto the target pixels; scaling the source image in the X or Y direction to produce intermediate pixels that are scaled in one direction by determining contributions to each intermediate pixel using a digital filter and accumulating the contributions for each intermediate pixel, wherein each source pixel contributes to one or more intermediate pixels and each intermediate pixel receives contributions from one or more source pixels; and subsequently scaling the intermediate pixels in the other direction by determining the contributions to each target pixel using the filter and accumulating the contributions for each target pixel; wherein each intermediate pixel contributes to one or more target pixels and each target pixel receives contributions from one or more intermediate pixels. The method is preferably carried out on a PE array in an SIMD (Simple Instruction Multiple Data) device".

As the examiner stated, Echerer and Okuno do not disclose:

"(5) calculate x, y virtual starting point of destination pixel for each frame;

(6) calculate virtual location of first destination pixel for new row in x-direction and interpolate new color values of color space of said first destination pixel from nearest source pixels located at nearest row of source pixels in y-direction;

(7) calculate virtual position of next destination pixel in x-direction according to scale factor and interpolate new color values of color space used of said next pixel from nearest source pixels located at nearest row of source pixels in y-direction;

(8) go to next step (8) if last destination pixel in x-direction has been reached otherwise go to step (6);

(9) go to step (11) if last row of destination pixels has been reached otherwise go to next step (9);

(10) calculate virtual location of next row in y-direction according to scale factor in y-direction and go to step (5);"

Applicant respectfully disagrees that Harasimiuk discloses "(5) calculate x, y **virtual starting point** of destination pixel for each frame", because Harasimiuk discloses, as cited by the examiner, (para. 0193; lines 1-6):

> "[0193] Mirroring in Y does **not require introducing `virtual pixels`**. In a simplified interpretation, as long as `virtual pixel` values are required (until such time as 2*Fw.sub.1/2 target clusters have been processed) the contributions from each of the source pixels will be added to two cells of the memory cell array instead of one."

"Virtual starting points" have been described in detail in the description of the claimed invention. The claimed invention discloses in regard of Figs 1b and 2 (para. 36)

> "[0036] It has to be understood that said distance between the pixels o of the destination image and the location in the graph, as shown in the graph of FIG. 1b, is an **artificial, or "virtual" distance or location, used for the** purpose of interpolation only. In reality the destination image 2, being decimated by the scale 7:3 in x-direction and by the scale 4:2 in y-direction, will be smaller than the source image 1 and hence the graph of FIG. 1b does not show the physical distance or the physical location of the destination pixels o."

Furthermore the claimed invention discloses in discussing Fig. 5 (para. 48; lines 19-31):

> "The following step 54 comprises the calculation of the x, y coordinates of the virtual starting point of destination pixels for a new frame. Said starting point, which is the middle of the first pixel, is calculated using the conversion scales calculated in the previous step. **As described earlier the location of the starting point calculated is a "virtual" location, it is used for interpolation only. It does not describe the actual physical location of the destination pixel.** Using the examples shown in FIG. 1b the "virtual" distance dist1x of the middle of the first pixel from the edge of the image in x-directions is:
>
> Dist1x=7/3.times.pixelwidthx/2,"

Applicant believes that "calculate X,Y virtual starting point" as claimed in step 5 of claim **27** of the claimed invention and described in detail has not been disclosed by Harasimiuk. There is no mention of "virtual pixels" beyond the first two lines of pa. 0193

of Harasimiuk shown above and there is neither a definition of said "virtual pixels" nor any suggestion of a calculation of said "virtual pixels" in the disclosure of Harasimiuk. Applicant believes furthermore that the "virtual pixels" mentioned by Harasimiuk (para. 0193) have a different function than the "x,y virtual starting point" of claim 27 of the claimed invention which has been described in detail as shown above.

Furthermore Harasimiuk does not disclose step (6) of claim 27 of the claimed invention

> "(6) calculate virtual location of first destination pixel for new row in x-direction and **interpolate new color values** of color space of said first destination pixel from nearest source pixels **located at nearest row of source pixels in y-direction;"**

Harasimiuk does not describe explicitly an interpolation of color values. Harasimiuk discloses (para. 0202):

> "[0202] So far, in our generic description of the algorithm for scaling of the digital images on the SIMD processing array, we treated the input pixels as a stream of (for example) **monochrome one-byte values**. Also, in order to make the description of the algorithm more transparent, we have generally assumed `one source pixel per PE` mapping for downscaling and `one target pixel per PE` mapping for upscaling."

In the following paragraphs Harasimiuk is describing the processing of a color-image, focusing on the addressing of his PE processor. Interpolation of color values is y mentioned only in one paragraph without explicitly describing HOW interpolation is performed. Harasimiuk has no focus on interpolation at all. Harasimuk discloses (Para. 0216):

> "[0216] Each of the target pixel values was computed analytically in X and Y as a convolution of the filter function and the image intensity step function taken over the filter support range. **Interpolation of the image intensity function produces some visual improvements, but for the majority of real-time applications the extra timing penalty outweighs the visual benefits.** Of much greater importance for the output quality is performing analytical rather then approximate convolution. For simplicity of description, the issues of border pixels and handling of extensions in X and Y directions have not been treated."

The sentence above in bold characters is the only reference to an interpolation in the description of Harasimiuk. Therefore applicant believes that Harasimiuk does not disclose "(6) calculate virtual location of first destination pixel for new row in x-direction and **interpolate new color values** of color space of said first destination pixel from **nearest source pixels located at nearest row of source pixels in y-direction;**"" as the claimed invention does.

Similarly Harasimiuk does neither disclose step (7) of claim 27 of the claimed invention:

> "(7) calculate virtual position of next destination pixel in x-direction according to scale factor and interpolate new color values of color space used of said next pixel from nearest source pixels located at nearest row of source pixels in y-direction."

nor does he disclose step (10) of claim 27 of the claimed invention:

> "(10) calculate virtual location of next row in y-direction according to scale factor in y-direction and go to step (5)

as the claimed invention does.

None of the applied or known references or a combination thereof disclose "(5) calculate x, y virtual starting point of destination pixel for each frame"; neither disclose "(6) calculate virtual location of first destination pixel for new row in x-direction and interpolate new color values of color space of said first destination pixel from nearest source pixels located at nearest row of source pixels in y-direction", neither disclose "(7) calculate virtual position of next destination pixel in x-direction according to scale factor and interpolate new color values of color space used of said next pixel from nearest source pixels located at nearest row of source pixels in y-direction;" and finally neither disclose "(10) calculate virtual location of next row in y-direction according to scale factor in y-direction and go to step (5)" as the claimed invention does in claim **27**. A combination of the three prior art references cited would not yield the claimed invention and is believed to be non-obvious.

None of the applied or known references address the claimed invention as shown in claim 27 in which a method to zoom a region of interest comprising "(5) calculate x, y virtual starting point of destination pixel for each frame; (6) calculate virtual location of first destination pixel for new row in x-direction and interpolate new color values of color space of said first destination pixel from nearest source pixels located at nearest row of source pixels in y-direction, (7) calculate virtual position of next destination pixel in x-direction according to scale factor and interpolate new color values of color space used of said next pixel from nearest source pixels located at nearest row of source pixels in y-direction;", and "(10) calculate virtual location of next row in y-direction according to scale factor in y-direction and go to step (5)" is disclosed.

The **combination** of a "Radiographic image enhancement comparison and storage requirement reduction system" (Echerer) with "number-of-pixel conversion apparatus and display apparatus using the same" (Okuno) and further in view of "Image scaling of a digital image to produce a different output format" (Harasimiuk) is believed to be **non-obvious** to achieve a method to zoom a region of interest from a digital image comprising the steps of "comprising "(5) calculate x, y virtual starting point of destination pixel for each frame; (6) calculate virtual location of first destination pixel for new row in x-direction and interpolate new color values of color space of said first destination pixel from nearest source pixels located at nearest row of source pixels in y-direction, (7) calculate virtual position of next destination pixel in x-direction according to scale factor and interpolate new color values of color space used of said next pixel from nearest source pixels located at nearest row of source pixels in y-direction;", and "(10) calculate virtual location of next row in y-direction according to scale factor in y-direction and go to step (5)" as taught by the claimed invention. The invention is believed to be patentable over the prior art cited, as it is respectfully suggested that the combination of these various references cannot be made without reference to Applicant's own invention. **None** of the applied references **address or suggest** the method steps cited above which have been disclosed by the claimed invention. Applicant has claimed his process in detail.

Claims 28-30, 34-35 and 37-39 are dependent claims upon base claim 27, which is believed to be patentable according to the arguments above.

The same arguments outlined for claim **27** apply for claim **40** as well. Applicant therefore believes claim 40 to be patentable. Claim **40** of the claimed invention discloses:

> **40.** A method to zoom a region of interest from a digital image comprises the following steps:
> (1) define size and location of region of interest as part of source image;
> (2) calculate the scale of decimation in x-and y-direction;
> (3) calculate number of columns of pixels of destination image according to scale of conversion desired in x-direction;
> (4) calculate number of pixels contained in a column of pixels of destination image according to scale of conversion desired in y-direction;
> (5) calculate x, y virtual starting point of destination pixel for each frame;
> (6) calculate virtual location of first destination pixel for new column in y-direction and interpolate new color values of color space of said first destination pixel from nearest source pixels located at nearest column of source pixels in x-direction;
> (7) calculate virtual position of next destination pixel in y-direction according to scale factor and interpolate new color values of color space used of said next pixel from nearest source pixels located at nearest column of source pixels in x-direction;
> (8) go to next step (8) if last destination pixel in y-direction has been reached otherwise go to step (6);
> (9) go to step (11) if last column of destination pixels has been reached otherwise go to next step (9);
> (10) calculate virtual location of next column in x-direction according to scale factor in x-direction and go to step (5); and
> (11) display zoomed region of interest in destination image.

The methods to zoom a region if interest from a digital image of Claims 1-40 are believed to be novel and patentable over these various references, because there is not sufficient basis for concluding that the combination of claimed elements would have

been obvious to one skilled in the art. That is to say, there **must be something in the prior art or line of reasoning to suggest** that the combination of these various references is **desirable**. We believe that there is **no such basis for the combination**. We therefore request Akilulu K. Woldemariam to reconsider his rejection in view of these arguments.

Reconsideration of the above rejections is therefore respectfully requested.

Reconsideration of the provisional rejection of claims 1, 3, 6-9, 14-16, 19-21, 27, 29, 32-35 and 40 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-7, 12-18, 23, 25-29, and 34 of copending Application No. 10/830, 329 is requested, based on the following remarks:

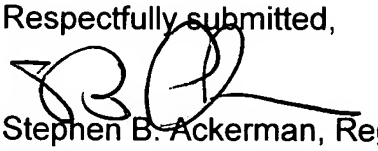
A Terminal Disclaimer is being submitted herewith to overcome the obviousness-type double patenting.

Applicants have reviewed the prior art made of record and not relied upon and have discussed their impact on the present invention above.

Allowance of all Claims is requested.

It is requested that should the Examiner not find that the Claims are now Allowable that the Examiner call the undersigned at 845-452-5863 to overcome any problems preventing allowance.

Respectfully submitted,



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